REMARKS

I. Introduction

By the present Amendment, claims 1, 12, 19, 21, and 23 have been amended. Claim 9 has been cancelled, without any prejudice or disclaimer to the subject matter recited therein. Accordingly, claims 1, 2, 6, 8, 12, and 16-24 remain pending in the application. Claims 1, 19, 21, and 23 are independent.

II. Office Action Summary

In the Office Action of October 30, 2009, claims 1, 8, 9, 12, and 16-18 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 5,517,994 issued to Burke et al. ("Burke"), in view of Japanese Patent No. JP 5000138 to Yoichi. Claims 2, 6, and 19-24 were rejected under 35 USC §103(a) as being obvious over Burke in view of Yoichi, and further in view of U.S. Patent No. 6,602,196 issued to Suzuki et al. ("Suzuki"). These rejections are respectfully traversed.

III. Rejections under 35 USC §103

Claims 1, 8, 9, 12, and 16-18 were rejected under 35 USC §103(a) as being unpatentable over Burke in view of Yoichi. Regarding this rejection, the Office Action alleges that Burke discloses an ultrasonic diagnostic system capable of performing self diagnostic tests on the system processing and control channels coupled to the transducer elements of the ultrasonic probe and the ultrasonic probe itself. The Office Action indicates that the system of Burke includes a probe that transmits and receives ultrasonic waves to and from a test subject, a diagnostic processor coupled to a number of sub-systems including the ultrasound probe, a beamformer, and an

image-and-Doppler processor which processes digital echo signals to form an image or provide a diagnostic measurement such as the velocity of blood flow. The Office Action further indicates that Burke discloses a judging section that includes a diagnostic processor operating under the control of a central system controller in order to monitor the probe-air interface by performing self diagnostic tests. The self-diagnostic tests are indicated as being performed to detect undetectable failures that can lead to a degradation in diagnostic performance, and can be used to compensate for detected tolerance conditions.

Yoichi is relied upon for disclosing an ultrasound system capable of adjusting operating characteristics by interrupting drive signals of the probe, when a judgment is made that the probe has been left in the air. This is indicated as being helpful in preventing heating and characteristic degrading. The Office Action concludes that it would have been obvious to combine the teachings of Burke and Yoichi to perform self diagnostic tests and prevent degradation of the probe elements so that ultrasound images can be obtained under optimal system specifications. Applicants respectfully disagree.

By the present Amendment, Applicants have amended the claims to better clarify the invention and incorporate features that are not shown or suggested by the art of record.

As amended, independent claim 1 defines an ultrasonic diagnostic apparatus that comprises:

> a probe that transmits/receives ultrasonic waves to/from a test subject;
>
> a transmitting section that supplies a drive signal to the probe;
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> a receiving section that receives a reflection echo signal outputted from the probe;

an image constructing section that reconstructs a diagnostic image on the basis of the received reflection echo signal;

a display section that displays the diagnostic image constructed by the image constructing section; and

a control section that controls these sections,

wherein the ultrasonic diagnostic apparatus includes a judging section that judges, on the basis of the diagnostic image information, that the probe is left in the air, and when the judging unit judges that the probe is left in the air, the control section controls the drive signals supplied to the probe from the transmitting section so as to suppress a rise in the temperature of the probe, and the control section reduces the frame rate sufficient for moving image reproduction of the diagnostic image.

Independent claim 1 provides an ultrasonic diagnostic apparatus that includes a probe which transmits/receives ultrasonic waves to/from a test subject, a transmitting section that supplies a drive signal to the probe, a receiving section that receives a reflection echo signal output from the probe, an image constructing section that reconstructs a diagnostic image based on the received reflection echo signal, and a display section that displays the diagnostic image constructed by the image constructing section. The ultrasonic diagnostic apparatus also includes a control section that controls the probe, transmitting section, receiving section, image reconstructing section, and display section. According to independent claim 1, a judging section is provided to determine whether the probe is left in the air based on the diagnostic image information. If the probe is determined to have been left in the air, the control section controls the drive signals supplied to the probe from the transmitting section in order to suppress a rise in the temperature of the probe. Additionally, the control section reduces the frame rate to be sufficient for moving image reproduction of the diagnostic image. At least one benefit achieved by the

apparatus of independent claim 1 is an ability to obtain an ultrasonic image during lower frame rates, as well as an ability to diagnose updating the moving image.

The Office Action alleges that the combination of Burke and Yoichi discloses all the features recited in the claimed invention. This does not appear to be the case. Burke discloses a system for testing the integrity of an ultrasonic transducer probe or the ultrasound system connected to the probe. The system appears to only relate to improvements in ultrasonic diagnostic imaging systems. While Burke provides an ultrasonic diagnostic imaging system capable of performing self diagnostics of the ultrasound transducer probe and channel electronics, the diagnostics being performed only relate to adjusting the channel of the probe by a user when the probe has been left in the air. Burke never discloses or suggests an ability for actually detecting whether or not the probe has been left in the air based on the diagnostic image information. Consequently, Burke is incapable of suppressing the amount of drive signals being supplied to the probe when it has been left in the air in order to prevent a rise in temperature of the probe. Additionally, Burke provides no disclosure or suggestion for reducing the frame rate sufficient for moving imaging reproduction of the diagnostic image.

Yoichi discloses an ultrasonic diagnostic apparatus that is capable of judging whether the ultrasonic probe is left alone in the air. This is done by detecting reflection of ultrasonic waves with an acoustic lens in order to control the transmission of waves from the probe according to the output detection. According to Yoichi, however, the ultrasonic wave is only transmitted once from the probe to 100 times of a system trigger. This is done in order to determine whether the ultrasonic probe has again been applied to the body, and to suspend output of the wave transmission suppression signal and return to the usual state. Yoichi,

however, fails to provide any disclosure or suggestion for reducing the frame rate sufficient for moving image production of the diagnostic image. Consequently, even if properly combined, the cited references would still fail to provide any disclosure or suggestion for features now recited in independent claim 1, such as "...the control section reduces the frame rate sufficient for moving image reproduction of the diagnostic image."

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2, 6, 8, 9, 12, and 16-18 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Claims 2, 6, and 19-24 were rejected under 35 USC §103(a) as being obvious over Burke in view of Yoichi, and further in view of Suzuki. Regarding this rejection, the Office Action alleges that the combination of Burke and Yoichi discloses most of the features recited in these claims. With respect to claims 19-24, for example, the Office Action admits that this combination fails to specifically disclose a control section that controls sections wherein the ultrasonic diagnostic apparatus includes a judging section that judges on the basis of brightness information, Doppler signal information, or CFM information. Suzuki is relied upon for disclosing an ultrasonic imaging apparatus that includes a B-mode processor and a Doppler processor. A controller is provided to control operation of the B-mode processor, Doppler processor, and CFM processor. This does not appear to be the case.

Independent claims 19, 21, and 23 each define an ultrasonic diagnostic apparatus that includes features somewhat similar to those recited in independent

claim 1. For example, a control section is provided for suppressing the quantity of the drive signals supplied to the probe from the transmitting section when the judging unit determines that the probe is left in the air, and to reduce the frame rate to be sufficient for moving image reproduction of the diagnostic image. As previously discussed, this particular feature is not shown or suggested by the art of record.

Applicants further note that the inclusion of Suzuki as an additional reference does not remedy this shortcoming. Suzuki discloses an ultrasonic imaging apparatus wherein a sound-ray density for scan is made nonuniform, and a sound-ray density is rendered dense at a required portion and coarse at portions other than the required portion. This is done in order to make both the maintenance of a scan range and a frame rate for ultrasonic imaging and high definition of an image compatible with each other. The apparatus is intended for scanning the inside of an object with an ultrasonic beam on a sound-ray sequential basis to receive echoes, and for generating a dynamic image based on a Doppler signal of the echoes. See col. 1, lines 11-17. Suzuki is completely silent on the use of a control section capable of reducing the frame rate sufficient for moving image reproduction of the diagnostic image. Accordingly, the combination of Burke, Yoichi, and Suzuki still fails to disclose or suggest all of the features recited in independent claims 19, 21, and 23.

It is therefore respectfully submitted that independent claims 19, 21, and 23 are allowable over the art of record.

Claims 20, 22, and 24 depend from claims 19, 21, and 23, respectively, and are therefore believed allowable for at least the reasons set forth above with respect to these claims.

IV. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 520.45475X00).

Respectfully submitted,
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